Brieger, in 1885, then showed the same to be true for tetanus and typhoid. Löffler, 1887, and Hankin, 1890, then showed the same to be true for diphtheria and for anthrax, and the toxins of tetanus, cholera, &c., were obtained shortly afterwards.

Thus was founded the doctrine of toxins. The bacilli of disease do not merely induce the formation of ptomaine poisons in the decomposing tissues; they form the toxins in their own cells, and then excrete them.

The lecturer then referred to the similarities of the venenenes of snakes, scorpions, and spiders; of the toxins in eels' blood; and of the vegetable toxins ricin, robin, &c., emphasising the fact that all these bacterial, animal, vegetable, and fungal poisons belong to one and the same great family of toxic bodies.

The horribly intoxicating and poisonous drink made by certain Siberian and Kamschatkan peoples from the fly Agaric, the dry gangrene and paralysis due to ergotism, now a rare disease in western Europe, and the effects of the toxins of tetanus, diphtheria, and other bacilli, all have points in common with the poisons of snakes, of certain seeds, and so on—certain Australian species of Swainsonia impel horses which have eaten it to behave as if trying to climb trees, or to refuse to cross a twig as if it were a large log, reminding one of the effects of *Amanita muscaria* on man.

In great part, if not entirely, owing to an experiment of Nuttall's in 1888, in which he found that normal blood has bactericidal properties, researches were undertaken which resulted in the discovery that the sera of animals, either normally or if rendered immune by minimal doses of toxins, contain antidotal substances to the toxins. Behring and Kitasato, in 1890, who demonstrated the antitoxic power of blood immunised with diphtheria or tetanus to the toxins of these bacilli, were followed in rapid succession by Brieger, Ehrlich, Pick, and others, and the doctrine of the anti-enzymes and antitoxins was established.

The lecturer then gave two illustrative cases. Dunbar, in 1903, showed that hay-fever, as already maintained by others, was not only due to the pollen of grasses, but he isolated from the pollen-grains a toxin which itself induces all the symptoms of the malady.

Not only so. He showed that the serum of horses, &c., to which the hay-fever is communicated becomes antitoxic to the malady. This antitoxin has been distributed, and the statistics uphold the accuracy of Dunbar's views.

That pollen-grains contain enzymes has long been known, and the experiments of Darwin and others have shown that some pollens are poisonous to the stigmas of the wrong plant. Another suggestive illustration is that given by Woron, in which, bees having conveyed pollen, together with the spores of a Sclerotinia, to the stigmas of certain species of Vaccinium, the pollen-tubes and the fungus-hyphæ race each other down the style, and the latter usually win, and destroy the ovules. Moreover, everyone knows how corrosive and destructive the pollen-tubes of pines, &c., are in the tissues, and we must not forget that pollen-grains are spores.

The second case dwelt on by the lecturer is that of pellagra, a disease to which the ill-nourished peasantry of maize-growing countries are liable in bad seasons, when the crops are poor and mouldy.

Cene and Beste, in 1902, referred the malady to the presence of an Aspergillus in the bad grain. They also extracted from this mould a highly toxic body. Mariani, in 1903, then showed that the blood of patients cured of pellagra is antitoxic to the poison of the disease.

The lecturer pointed out that, without committing ourselves to any premature opinion as to the absolute accuracy of these views, there are two increasing classes of evidence which support his suspicion that numerous as yet insufficiently examined cases of this kind will turn out to be due to what he calls "lurking parasites" in bad grain and fodders.

The first is the large class of mycoses now referred to the poisonous action of such a "mould" as Aspergillus, a fungus shown to abound in enzymes and toxic bodies. The second is the increasing number of cases of poisoning by fodder and grain-plants, normally wholesome, but found to be deleterious in certain circumstances or years.

Cases of poisonous wheat, oats, &c.—the "Taumel-Getreide," "Taumel-Roggen" of the Germans—have long been known, and the lecturer quoted cases where similar noxious effects are traced to the presence of Ustilagineæ, Helminthosporium, Cladosporium, and other fungi.

A notable case is that of the Darnel, a tiresome weed in some countries. The ancients—*e.g.* Galen—knew that darnel in bread causes dizziness, headache and sickness, and thought that neglected wheat, &c., was transformed into darnel. Hofmeister, in 1892, examined and extracted the toxic bodies, and confirmed the repeated statements as to their deleterious and even fatal action on animals.

Yet it was not until 1898 that Vogl discovered the existence of a mycelium in the seed-coats of the poisonous darnel, and in the same year this was confirmed by Hanausek and Nestler, though they did little beyond recording the presence of a fungus.

In 1903, Freeman, in the lecturer's laboratory at Cambridge, worked out the details, and left no doubt that the poisonous property is due to the fungus.

The lecturer then pointed out that a whole series of questions concerning these and similar diseases now being investigated in his laboratory lie under suspicion of connection with grain-poisoning, or at any rate with poisoning of fungi introduced as food.

To say the least, we want further and extensive researches from this point of view into the ætiology of Acrodymia in Mexico, Algeria, &c., and of the Colombian Pelade, of the "trembles" of cattle and sheep, and of the "milk sickness" of the North American prairies, and even diseases like beri-beri, &c.

The conclusions, the lecturer pointed out, to which we are driven may be thus summarised:—

(1) Fungi, like animals and other plants, including bacteria, excrete enzymes, and utilise them in the same way and for the same purposes.

(2) The poisons of the fungi are toxins, not only similar in character to the poisonous alkaloids, toxalbumens, &c., of the bacteria, and of the higher plants, the venenenes of the snakes, &c., but their poisonous actions in the paralysis of nerve-ends, &c., are essentially the same.

(3) These poisons, &c., introduced into the blood of animals, call forth the activities of antitoxins and anti-enzymes, as do the toxins of animals, bacteria, &c., in similar circumstances.

(4) The presumption is, therefore, justified that the action of the enzymes and toxins of parasitic fungi on the proteid cell-contents of their plant-hosts is similar in principle to that on animal proteids, and that the host reacts by means of anti-enzymes and antitoxins.

The lecturer then adverted to the difficulties of obtaining the toxins and antitoxins from sap, and concluded by showing in specific cases—the rusts of wheat and grasses—how probable it is that, since no anatomical features explain the facts of predisposition and immunity, and the latter cannot be referred to climatic conditions or to peculiarities of soil, &c., the above considerations will be found to apply, a matter dealt with elsewhere by the lecturer.

TRYPANOSOMIASIS AND EXPERIMENTAL MEDICINE.[1]

THE greater portion of the first Report deals with the subject of human trypanosomiasis, particularly in the Congo district. The trypanosomata are flagellated protozoa, which have been found to be parasitic in many animals, sometimes causing no symptoms, as in the rat, but sometimes associated with serious effects, as in the tsetse-fly disease of the horse. During the last few years trypanosomata have been found to be parasitic in man in various districts of West and Central Africa. If the infected person shows irregular fever without other marked symptoms the condition has been termed trypanosomiasis; if in addition there is somnolence and stupor, and later wasting, convulsions, and fatal coma, the condition is the

1 "Reports of the Trypanosomiasis Expedition to the Congo, 1903-1904." Liverpool School of Tropical Medicine. Memoir xiii. Pp. 111. (1904.) Price 15*s*.

"The Thompson-Yates and Johnston Laboratories Report." Vol. vi. (New Series), Part i., January, 1905. Pp. 205. (University Press of Liverpool; London: Williams and Norgate.) Price 12*s*. 6*d*.

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dreaded sleeping sickness which has destroyed tens of thousands of lives in Central Africa. Much of the matter in the volume under review deals with the relationship between these two diseases.

The first article is a report by Messrs. Dutton, Todd, and Christy on an expedition into the Congo Free State, undertaken at the request of the King of the Belgians. At the hospital at Boma, and during a journey into the cataract region, a number of patients were seen who were regarded by the district medical officers as cases of sleeping sickness, but in whom the somnolence, so characteristic of the disease in Uganda, was completely absent. Nevertheless, trypanosomes were found in the blood both of those cases in which the diagnosis of sleeping sickness was certain and of those which were atypical. But in addition trypanosomes were frequently seen in the peripheral blood of apparently healthy individuals.

In the next article, the relationship of human trypanosomiasis to Congo sleeping sickness is discussed by

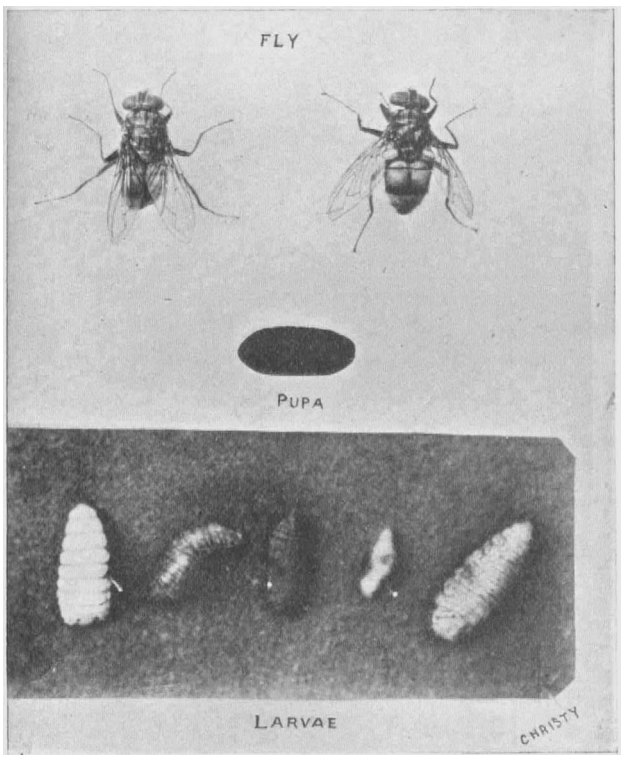

FIG. 1.—Flies, pupa and larvæ (nat. size) of the Congo Floor Maggot.

the same observers. The conclusion is arrived at that the *Tr. gambiense* of the first-named condition is the probable cause of Congo sleeping sickness; but it must be admitted, in spite of the positive statements which have been made on the subject, that something remains to be cleared up. This view is confirmed by Dr. Christy's researches on the cerebro-spinal fluid in sleeping sickness. He considers that all that can definitely be stated is that (1) on the whole the presence of the trypanosome parasites in the cerebro-spinal fluid tends to increase the gravity of the case, (2) in many cases trypanosomes never find their way into the cerebro-spinal fluid, and (3) in the vast majority of cases death is the result of complications, mainly bacterial infections.

The identity or non-identity of the various trypanosomes of man has been investigated by Dr. Thomas and Mr. Linton, who conclude that the parasites found (*a*) in the cerebro-spinal fluid of Uganda sleeping sickness, (*b*) in that of Congo Free State sleeping sickness, (*c*) in the blood of Uganda trypanosomiasis cases, and (*d*) in the blood of Congo Free State trypanosomiasis cases, are all identical in morphology and animal reactions with the *Tr. gambiense*.

In an interesting paper, Messrs. Dutton, Todd, and Christy describe the Congo floor maggot, a blood-sucking dipterous larva extensively found in various parts of the Congo Free State, and identified by Mr. Austen as the *Auchmeromyia luteola*, Fabr. These larvæ seem to lurk in the cracks and crevices of the mud floors of the native huts, from whence they emerge at night and attack the persons sleeping there. The volume concludes with a note by Mr. Austen on tsetse-flies. Since his monograph on the tsetse-flies was issued, further observation has convinced Mr. Austen that the *Glossina tachinoides*, regarded by him as a variety of *G. palpalis*, must be reckoned as a distinct species.

The volume of the Thompson-Yates and Johnston Laboratories Report contains the reports on trypanosomiasis, &c., described above, and several additional papers of interest. Dr. Stephens describes a new hæmogregarine from an African toad, two cases of intestinal myiasis (fly larvæ) observed in children in Liverpool, a note on swellings of uncertain ætiology in a tropical patient, and a note on non-flagellate typhoid bacilli. The last named were from an old laboratory strain which had been subcultured for some years, and seemed completely to have lost their flagella and motility. Mr. Shipley describes a new human trematode parasite from German West Africa, and Mr. Dutton defines the intermediate host of a lymph worm (filaria) of an African swift; this is found to be the louse which infests these birds. Prof. Moore and Mr. Roaf contribute an important experimental study of the physical chemistry of anæsthesia, from which they conclude that chloroform forms an unstable chemical compound or physical aggregation with proteid and hæmoglobin, and is carried in the blood in such a state of combination, the compounds so formed limiting the chemical activities of protoplasm and inducing anæsthesia. Mr. Edie describes the action of chloroform on serum proteids and hæmoglobin, and, lastly, Mr. Roaf and Mr. Edie describe a simple method for the preparation and determination of lecithin which seems to be a great improvement on the methods hitherto in use. Both volumes are beautifully printed and illustrated, and appear in a new cover, which, artistically, is a great improvement on the old one. R. T. HEWLETT.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—The General Board of Studies has appointed Mr. T. S. P. Strangeways, St. John's College, Huddersfield lecturer in special pathology, from Lady Day, 1905, until Michaelmas, 1909, and the appointment has been confirmed by the Special Board for Medicine. Mr. R. P. Gregory, of St. John's College, has been appointed senior demonstrator in botany for four years, until June 24, 1909.

The list of successful candidates for open scholarships at Downing College is so far unusual that all the winners are natural science students. It is as follows:—A. W. Bourne, Rydal Mount School, Colwyn Bay, 50*l.*; A. C. Johnson, Merchant Taylors' School, 40*l.*; W. G. Stevens, The Leys School, Cambridge, 40*l.*; I. K. Matthews, Merchant Taylors' School, Crosby, Liverpool, 40*l.*

OXFORD.—The university has resolved to contribute a sum not exceeding 1000*l.* towards the printing of that portion of the British section of the International Astrographic Catalogue which has been executed at the university observatory.

By a statute passed in 1904, the university established a "diploma in scientific engineering and mining subjects," and the committee appointed to arrange the details of the scheme has now issued the regulations concerning the diploma. Members of the university will be eligible for the diploma who have passed at the examinations required for the degree of B.A., and have satisfied the examiners in certain special subjects mentioned in the following list, after an approved course of study in those subjects extending over two years, and have also gone

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